

Geomorphological correlation of the tectonically displaced Tejo River terraces (Gavião–Chamusca area, central Portugal) supported by luminescence dating

A.A. Martins^{a,*}, P.P. Cunha^{b,1}, S. Huot^{c,2}, A.S. Murray^{c,2}, J.P. Buylaert^{c,2}

^a*Department de Geociências da Universidade de Évora, 7002-554 Évora, Portugal*

^b*Department de Ciências da Terra, IMAR—Instituto do Mar, Universidade de Coimbra, Largo Marquês de Pombal, 3000-272 Coimbra, Portugal*

^c*Nordic Laboratory for Luminescence Dating, Department of Earth Sciences, Aarhus University, Risø National Laboratory, DK-4000 Roskilde, Denmark*

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Abstract

A suite of fluvial terraces (T1–T6, from top to bottom of the staircase) occur along a ~70 km stretch of the Tejo River in central Portugal, between the small towns of Gavião and Chamusca. Terrace correlation was based upon the following: (a) aerial photograph analysis, geomorphological mapping and field topographic survey; (b) sedimentology of the terrace deposits, namely the maximum particle size, clast composition and lithofacies identification; and (c) K-feldspar infrared stimulated luminescence (IRSL) dating of the three lower terraces levels, as quartz optically stimulated (OSL) signal of the samples from these terraces was too close to saturation for all but two samples. The two upper terraces (T1 and T2) lack suitable materials for luminescence dating (e.g. sands/silts), but also their probable ages are beyond the upper range of the dating method. Faults affecting terraces and older deposits have been reported. The luminescence dating results suggest that some assignments of local terrace remnants were incorrect because of fault-related vertical displacements. The luminescence dating procedure also included a correction for anomalous fading in order to obtain more reliable estimates of the burial ages. The fading rate was identical for all samples, so for correlation of the terraces anomalous fading of the feldspar IRSL signal is considered not to be a significant problem. The T5 terrace has corrected ages of ~42–99 ka, the T4 from ~107 to 222 ka and the T3 terrace has a minimal age of ~300 ka. Fluvial incision appears to have been principally controlled by regional uplift but also by localised movements along fault structures. Using the corrected ages of the T4 surface a time-averaged incision rate can be quantified as follows: (1) ~0.29 m/ka for reach III, (2) ~0.53 m/ka in the Chamusca area (east side on reach IV) and (3) ~0.13 m/ka in the Mato Miranda area (west side on reach IV, the less uplifted block according to the geomorphic framework).

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1. Introduction

The Tejo River is the longest fluvial system of the Iberian Peninsula (1007 km), flowing from the Sierra de Albarra-cim (1593 m altitude, in the Cordillera Iberica) and discharging to the Atlantic Ocean, near Lisboa (Fig. 1). Flowing to the southwest, the Tejo River crosses the Madrid Tertiary Basin (in Spain) and the Lower Tejo

Tertiary Basin, in Portugal. These sedimentary basins are separated by an uplifted block of resistant rocks belonging to the Hesperian Massif, which was deformed during the Hercynian orogeny. Both the Madrid and the Lower Tejo Tertiary Basins are composed of smaller structural depressions, i.e. Campo Arañuelo Basin and Tietar valley in the west side of the Madrid Tertiary Basin and the Castelo Branco Basin in the northeast sector of the Lower Tejo Tertiary Basin. These sub-basins are separated by areas of basement, onto which the Tejo River is superimposed probably since the Pliocene (Cunha et al., 1993). This morphostructural framework created distinct morphological characteristics during the incision stage of the drainage: (1) reaches with valleys strongly incised into basement, either lacking fluvial terraces or showing rare terrace

*Corresponding author. Tel.: +351 266 745300; fax: +351 266 745397.

E-mail addresses: aam@uevora.pt (A.A. Martins), pcunha@det.uc.pt (P.P. Cunha), sebastien.huot@risoe.dk (S. Huot), andrew.murray@risoe.dk (A.S. Murray), jan-pieter.buylaert@risoe.dk (J.P. Buylaert).

¹Tel.: +351 239 860 500; fax: +351 239 860 541.

²Tel.: +45 46775979; fax: +45 46774959.